

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : **07-089852**

(43)Date of publication of application : **04.04.1995**

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(51)Int.Cl.

**A61K 31/19**

**A23L 1/304**

**A61K 9/16**

**A61K 33/06**

**A61K 33/08**

**A61K 33/10**

**A61K 35/56**

**A61K 35/78**

**A61K 35/80**

**A61K 47/12**

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**(54) WATER-SOLUBLE POWDER CONTAINING CALCIUM IN HIGH CONCENTRATION AND ITS PRODUCTION**

**(57)Abstract:**

**PURPOSE:** To obtain water-soluble powder of calcium and to provide its production for evaporating only water from an organic acid or an organic acid-containing liquid having dissolved calcium in high concentration, powdering.

**CONSTITUTION:** This water-soluble powder of calcium is obtained by dissolving a calcium-containing substance in an organic acid or an organic acid-containing liquid, evaporating only water, powdering. The powder is

obtained by evaporating only water in a solution of calcium in the organic acid or the organic acid- containing liquid from the solution by using spray dryer, etc. The powder can dissolve calcium in water in a high ratio of 30 times as much as in milk and has neither unpleasant taste nor smell which calcium has essentially. The powder makes an irritating smell of an organic acid even into a mild acidity, can be orally administered as it is or added to various kinds of foods and orally administered and supply all users from old people to children with calcium while enjoying its taste.

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#### LEGAL STATUS

[Date of request for examination] 14.10.1996

[Date of sending the examiner's  
decision of rejection]

[Kind of final disposal of application  
other than the examiner's decision of  
rejection or application converted  
registration]

[Date of final disposal for application]

[Patent number] 2923181

[Date of registration] 30.04.1999

[Number of appeal against examiner's  
decision of rejection]

[Date of requesting appeal against  
examiner's decision of rejection]

[Date of extinction of right]

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**CLAIMS**

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[Claim(s)]

[Claim 1] Water-soluble powder of the calcium characterized by having evaporated only moisture and carrying out disintegration after dissolving the calcium content matter in an organic acid thru/or an organic-acid content liquid.

[Claim 2] Water-soluble powder according to claim 1 whose calcium content matter is activity calcium obtained by calcinating oyster husks and/or seaweed.

[Claim 3] Water-soluble powder according to claim 1 whose organic-acid content liquid is pineapple fruit juice.

[Claim 4] Water-soluble powder according to claim 3 whose pineapple fruit juice is juice of the pineapple which included the hide part of a pineapple.

[Claim 5] Water-soluble powder according to claim 1 which is abbreviation globular form granularity powder with which powder consists of porous structure.

[Claim 6] The manufacture approach of the water-soluble powder of the calcium characterized by evaporating only moisture and carrying out disintegration from the organic acid of the calcium content matter thru/or the solution of an organic-acid content liquid.

[Claim 7] The manufacture approach according to claim 6 which is what disintegration depends on the granularity-ized means by the spray dryer.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]**

**[0001]**

**[Industrial Application]** This invention relates to the water-soluble powder of calcium which only moisture is evaporated and carries out disintegration from the solution of the organic acid thru/or organic-acid content liquid which dissolved high-concentration calcium, and its manufacture approach in more detail about the water-soluble powder and its manufacture approach of calcium.

**[0002]**

**[Description of the Prior Art]** It is solved that that calcium is a component indispensable to formation of a bone or a gear tooth is most important nutrient that supports not only it but all life processes recently although recognized widely, and, now, calcium attracts attention by the medical front line. It is also recognized also becoming the cause by which the lack of calcium causes diseases, such as not only osteoporosis but a gun, hypertension, arteriosclerosis, myocardial infarction, cerebral infarction, diabetes mellitus, an immunity failure, etc., for human being, and that it is pointed out and calcium content food must be taken in so much.

**[0003]** The present condition that the illnesses which make the start osteoporosis considered to originate in the lack of calcium are occurring frequently has been recognized, and the Ministry of Health and Welfare of our country also recently corrected just 600mg / one day to which it came as required calcium intake for the body to the former on 800mg / 1st. However, this intake desired value is a value computed as an amount of calcium of 100mg per 100ml of cow's milk, and in fact, 400ml half calcium is absorbed at most by the inside of the body just because it drank 800ml of cow's milk.

**[0004]** Although only the part by which the calcium taken in was ionized in the stomach is absorbed by the inside of the body, when Lynn, a fat, and the matter that checks absorption of calcium like protein are contained in coincidence, it has become clear that the utilization factor of calcium is

subtracted only for the part.

[0005] Therefore, although the contents of the calcium of cow's milk were 100mg / 100ml, there were most calcium contents in food and absorptivity was also made good, the absorption utilization factor of the calcium by which many researchers are contained in cow's milk from the above-mentioned reason has recently announced that it is not necessarily good. Actually, from the Europeans and Americans who are taking in numbers of times as much cow's milk as Japanese people and dairy products, it is also a fact that there is a scholar who is refuting the opinion "calcium is cow milk wells" also from it being far few in a Japanese person, and the rate of fracture is persuasive.

[0006] Therefore, if the calcium on 800mg / 1st which the Ministry of Health and Welfare recommends is temporarily taken in only from cow's milk, it will be said that the cow's milk of the huge amount of 1600mg / one day must be drunk. Anyway, although recognized widely, if it cuts, it will be what kind of approach that a lot of calcium must be taken in, and it will not have proposed the suitable approach about taking in the calcium of an initial complement.

[0007] Moreover, if a bodily function is not recently suitable for the milk intake after the weaning period other than people of the Europe district or a desert zone who could not but depend on milk and could not but survive it as habit of human being's eating habits for many years and such people drink cow's milk so much, the shocking research result of being easy to start a cataract is also reported (educational medical-affairs newspaper July 25, Heisei 5). Not only calcium but a fat, protein, Lynn, etc. are included in cow's milk so much, and this is considered to have suggested the evil of taking in a fat, protein, etc. to coincidence with calcium.

[0008] Therefore, naturally the requirements of calcium are not only unsuppliable with cow's milk, but in the present condition pointed out, it is sometimes holding danger under the situation that it must take taking in the calcium of an insufficiency into consideration, from other eating-and-drinking articles. However, it is in the situation in which the dried sardines and the sardine which are known for except for cow's milk as calcium content food, the edible brown algae, the toasted laver, etc. of the calcium content not reaching distantly [ requirements / of a day ] at all, but taking in the requirements of calcium from the usual meal after all are impossible. Consequently, it will be in a chronic calcium insufficient condition, and has become the above and the cause which causes various kinds of illnesses.

[0009] Furthermore, when it sees about the case where it is vitamin D by which promoting absorption of calcium is known, vitamin D is what it is generated by sun irradiation from provitamin D in the living body, and also can be taken in from food. Although it serves as activity vitamin D and helps the absorption from the intestinal tract of calcium by work of parathyroid hormone, the vitamin D taken in When this operation is because the calcium from a bone is taken out in collaboration with parathyroid hormone and vitamin D is taken in

[ consequently ] superfluously, it is known a hypercalcemia, uremia, and that failures, such as osteomalacia, will be brought about further. In the U.S., the present condition is not accepting vitamin D as physic by FDA.

[0010] Thus, there is admiration recognized as what has that an absorbed amount [ as opposed to the body even in the cow's milk which is absorptivity most, and it is supposed that is excelled ] is in \*\*\*\*\*, and commonsense already it is in a situation with it very difficult [ for it to compensate the calcium of requirements from food in the present condition that superfluous intake of cow's milk moreover does damage to the body on the contrary ], and intake of the calcium from other than food must be taken into consideration.

[0011] As expression of the recognition, the present condition that the calcium preparation as the so-called health supplement is marketed can be seen. however -- if the calcium preparation marketed has many which are sold as a tablet and is usually a healthy person -- at any rate -- \*\* -- for people who hold the illness which must carry out and must carry out a lot of calcium intake, especially an old man, the case where it is carrying-out [ itself ]-deglutition of this pain may often happen.

[0012] Of course, although a calcium preparation is made into granularity or the attempt which liquefies is also made in order to solve the problem of being hard to drink, the three major faults which unpleasant tastes peculiar to calcium, such as bitterness, an astringent taste, etc. with which a calcium preparation cannot melt into the trouble currently originally held, i.e., water, easily even in this case, cannot be and drink easily of being further hard to absorb on the body are left behind in the condition that it must still have been solved.

[0013] Moreover, also in the medical site, when it bleeds in a traffic accident etc., if pH in the living body becomes acidity rapidly, it is quick and this is not adjusted to neutrality thru/or alkalescence, it is known that its noble life will be lost. Therefore, although the water solution of the calcium chloride for injection which made calcium aqueous is used, taking orally is impossible for this, and also when it uses as an object for injection, the lifting and the danger of becoming the cause of death from shock are pointed out in the paradox phenomenon. Therefore, Professor Toyoyuki etc. Tamura of the Nihon University medical department etc. has reported taking orally being possible and waiting for the appearance of the water-soluble calcium which can supply high-concentration calcium promptly.

[0014] Although this invention persons continued for years and have continued research by making the calcium preparation excellent in the absorptivity to the body, and the calcium preparation in consideration of the ease of drinking into a technical problem, they have applied for JP,60-56795,B, JP,1-13691,B, JP,1-13692,B, Japanese Patent Application No. No. 200851 [ three to ], and JP,5-161480,A as the result.

[0015] The above and invention indicated by JP,60-56795,B start manufacture

of the electrorefining object of the oyster husks in which high-concentration ionized calcium concentration is shown, including a mineral component so much. This electrorefining object is preeminently excellent in absorption within intestines, and it is proved that the rate of deposition to a bone is very high, and current is positively adopted as a supplement for prevention of an adult disease, and a therapy in medical institutions including the attached hospital of each university.

[0016] Moreover, invention indicated by JP,1-13691,B and JP,1-13692,B is what blended the mixture of a reduction maltose and an organic acid with electrolysis oystershell ionized calcium, improves stimulative and gustation which a calcium preparation originally has, and has the description at the point of having enabled it to take in calcium deliciously.

[0017] this invention persons complete the water-soluble calcium preparation which can solve this trouble at once, as a result of repeating research that taking orally is possible on the starting technical base, and the improvement of solubility to amelioration of an unpleasant gustation and an unpleasant unpleasant smell peculiar to a calcium preparation, completion of the pharmaceutical preparation which contains calcium by high concentration further, and water should be earnestly attained on it.

[0018]

[Objects of the Invention] Then, the purpose of this invention removes the unpleasant gustation and the unpleasant odor which a calcium preparation originally has, and can take in high-concentration calcium deliciously, and the solubility to water is to offer the manufacture approach of the calcium powdered pharmaceutical preparation and this pharmaceutical preparation which improved remarkably.

[0019]

[Means for Solving the Problem] After proposing this invention in order to attain said purpose, dissolving the calcium content matter in an organic acid thru/or an organic-acid content liquid and changing it into a solution condition, it has the description important for the point which carries out disintegration by evaporating only moisture. That is, according to this invention, after dissolving the calcium content matter in an organic acid thru/or an organic-acid content liquid, only moisture is evaporated and the water-soluble powder of the calcium characterized by making it powder is offered. Moreover, according to this invention, the manufacture approach of the water-soluble powder of the calcium characterized by evaporating only moisture and carrying out disintegration from the organic acid of the calcium content matter thru/or the solution of an organic-acid content liquid is offered.

[0020]

[Detailed Description of the Invention] After the greatest technical feature of this invention changes the calcium content matter into the solution condition of an organic acid, it evaporates only moisture and is in the point which carries

out disintegration after calcium and an organic acid have joined together. That is, although it has already been proposed by these people as the calcium preparation the absorbance to the body carried out \*\* ionization of the conventional calcium which was, and raised the absorptivity to the body even if it drank was mentioned above since the solubility to water is low, if it remains as it is Even if it melts to organic acids, such as a fermentation lactic acid and a citric acid, also in the case of this pharmaceutical preparation, the rate of the dissolution of calcium is at most 100mg to 100ml, and the calcium preparation with the still higher solubility to water is called for.

[0021] By this invention's being able to respond suitable for such a request, and carrying out disintegration with the aforementioned means Moreover, a lot of no less than 3000mg calcium dissolves to 100 cc of water promptly to water. Even the stimulative taste which a part of [, such as a lactic acid, an acetic acid, and a malic acid, ] organic acids originally had changes to a mellow acid taste, it succeeds in removing unpleasant tastes and unpleasant odors, such as bitterness and astringency, and the improvement on the taste and olfaction is obtained by the still more surprising thing. And though drunk as it is by [ powdered ] having been, having carried out and having made it granularity Like the tablet which is the still more conventional offer gestalt when it furthermore melted and drinks in water It will be understood that the three major faults of the calcium preparation of being hard to absorb which are hard to drink and which cannot melt easily are solvable at once with this invention, as the problem of being hard for an old man and a child to do a deglutition was solved and being mentioned above.

[0022] With the calcium content matter which can be used by <calcium content matter> this invention To marine algae, such as the shells and crustacean which were developed by this invention persons, coral, a bone, edible brown algae, an Undaria pinnatifida, and \*\* not coming, and a pan The calcium oxide obtained by carrying out elevated-temperature baking of at least one sort of the calcium content matter of animals, such as a spinach and parsley, or the vegetable origin is made into the start. Although all of the calcium content matter of a mineral origin like a calcium carbonate, calcium phosphate, a calcium hydroxide (slaked lime), a calcium lactate, and calcium gluconate can be used Especially, the calcium oxide which calcinated this at the elevated temperature is most preferably used by using oyster husks and/or seaweed as a raw material.

[0023] the calcium oxide of elevated-temperature baking -- for example, the raw material of said animal and/or the vegetable origin -- 900 thru/or 1100 degrees C -- desirable -- an elevated temperature (930 thru/or about 970 degrees C) -- it is -- 40 minutes -- or it is preferably obtained 50 minutes thru/or by calcinating about 70 minutes for 80 minutes. This product is usually the powder of kind white.

[0024] <An organic acid or organic-acid content liquid> As the organic acid or



organic-acid content liquid which dissolves said calcium, the liquid containing organic acids, such as a lactic acid, a citric acid, a malic acid, and an acetic acid, and this organic acid is mentioned. Moreover, as an organic-acid content liquid, the juice of fruit, such as a pineapple and a papaya, i.e., fruit juice, is used, and it is the point of the solubility of calcium, and the gustation of generation granulation, and the juice containing the hide section of the pineapple which uses a lactic acid as a principal component is used especially most preferably. Hereafter, in this invention, the organic acid or organic-acid content liquid which dissolves said calcium may only be called a "calcium solution."

[0025] Although solubility changes with classes of organic acid, <disintegration of calcium solution> calcium can be used as the water-soluble powder in the condition that calcium and an organic-acid component joined together, by from now on evaporating only moisture, if the solution condition uniform regardless of solubility is formed. In this invention, the component of the unpleasant taste or an unpleasant smell is also considered because it is flown by coincidence in the process at which it evaporates only moisture that the taste and an odor with the generated water-soluble unpleasant calcium powder are extinguished.

[0026] Although methods, such as freeze drying by the method and freeze-dry method which are ground after the vacuum drying using granularity-izing and the band conveyor accompanied by spraying by the spray dryer, are used as a means which carries out disintegration, it is the point that the granularity powder with which a product has globular form foaming structure mostly is obtained, and the disintegration means by the spray dryer is the most suitable.

[0027] A spray dryer evaporates only moisture, may make it flow down said calcium solution in the shape of a fog from the upper part of cyclone-like equipment, and may make binders, such as a dextrin and a carboxymethyl cellulose, or an ascorbic acid, fruit sugar, etc. to be the method which makes only calcium and an organic-acid component granularity in an instant, and pour at any time in the middle if needed by the hot blast blown from an upper part side face and a lower part side face.

[0028] Pouring of a binder is effective when enlarging particle size of a product more, and it can be suitably changed according to the particle size of the product which also makes the purpose the amount to pour. Incidentally, the particle size of the product when not pouring a binder is 0.005mm thru/or about 0.02mm, and the product which has the particle size of 0.01mm thru/or about 2mm is obtained by making said binder pour to obtain the thing of the diameter of a large drop from this.

[0029] In addition, the sugar contained in fruit juice functions as a moderate binder, and the calcium solution using the fruit juice of the pineapple mentioned above has a little big particle size, and a front face is porosity and it can form granularity globular form powder mostly. The calcium preparation of the organic-acid content granulated with the spray dryer becomes the factor a

configuration being globular form granulation mostly and having porous structure indicates the solubility in which is the description and this structure was excellent promptly to water to be.

[0030]

[Example] Although an example explains this invention below, it is not restrained by this example unless it deviates from the technical thought of this invention.

[0031] After fully washing the preparation oyster husks of <example 1> calcium powder and removing a black part, about 8kg of things broken in about [ 5cmx5cm ] magnitude with the grinder was prepared. Moreover, about 5kg of things which fully washed edible brown algae was prepared. Next, said oyster husks and edible brown algae which were ground were put on the titanium tray of 80cmx80cmx5cm magnitude, and it calcinated at 950 degrees C with the electric furnace for 1 hour. The oyster husks and edible brown algae after baking were ground by the colloid mill, and the white powder (sample 1) of the calcium oxide whose mean particle diameter is about 200 meshes was obtained.

[0032] When it mixed with the 100 weight sections and the pineapple fruit-juice (what carried out juice of part of hide to coincidence) 900 weight section in ordinary temperature and the preparation sample 1 of water-soluble calcium powder was made to \*\* a top gradually, it dissolved completely at nearly 70 degrees C. This calcium solution was kept warm and filtered at 75\*\*5 degrees C, the filtrate was supplied and granulated to the spray dryer, and globular form-like granulation powder with a mean particle diameter of about 7micro was obtained. This powder had the fresh acid taste of taste, to 100 cc of water, dissolved quickly and formed the transparent solution for 3000mg. That is, compared with the amount of 100mg of the calcium contained in 100ml of cow's milk, calcium can be contained by 30 times [ no less than ] as many high concentration as this, moreover, Lynn which bars the absorptivity of calcium, a fat, and protein are not contained at all, he adds the water solution of the water-soluble calcium powder of this invention to all food and drinks, and it will be understood that it is the epoch-making thing which can take in calcium deliciously.

[0033] After finishing adding the specified quantity, being careful of the <example 2> precipitated-calcium-carbonate 110 weight section for liquid not to overflow by foaming in addition to the pineapple fruit-juice 900 weight section used in the example 1 small quantity every, it filtered, after foaming of gas stopped and the filtrate was made into granularity like the example 1. This powder also has the fresh acid taste of taste, and dissolved quickly to water.

[0034] It mixed with the <example 3> calcium-hydroxide (slaked lime) 90 weight section at the 50% water-solution 900 weight section of citric acids, and granulation powder was obtained like the example 1 except having made it dissolve at 75\*\*5 degrees C. Although this powder had a little strong acid

taste compared with the thing of an example 1, when compared with the acid taste of citric-acid original, it was a very mellow thing which is easy to drink.

[0035] The effect to Homo sapiens bone quantity was measured on the following conditions using the calcium powder obtained according to the <application effectiveness of calcium powder> example 1. 32 37 years old to 81 year-old man-and-woman adults without a metabolic disorder which may carry out a bone metabolic turnover and may affect it are made into the control group which does not take calcium, and it is a calcium recipe group, The calcium powder got by the adult of the same age in said 900mg [ per ] example 1 day was made to take in taking orally in 3 steps immediately after a meal, and the bone density of the 2nd, 3, and 4 lumbar vertebrae was measured about both groups with the xR-26 mold duplex energy X-ray absorption measuring device of Norland at the time of three months, six months, and 12-month progress. The average of both the all the members' groups was shown in Table 1.

[0036]

表 1

服用期間	コントロール群 (%)	カルシウム服用群 (%)
3か月	-2.9 ± 0.75	+1.6 ± 0.51
6か月	-2.8 ± 0.42	+1.5 ± 0.61
12か月	-3.4 ± 1.01	+0.5 ± 1.02

By the group which took the water-soluble calcium powder of 900mg [ per ] this invention from the above result day to there having been a phenomenon of 2 thru/or 3% of bone quantity by the control group which does not supply calcium in connection with 3, 6 or 12 months, and the passage of time, as for this, the increment in bone quantity was accepted conversely.

[0037]

[Effect of the Invention] According to this invention, the water-soluble calcium powder containing the high-concentration calcium in the condition that an organic-acid component and calcium joined together is offered. This powder The dissolution of the calcium to water is enabled at 30 times as much high rate as cow's milk. Moreover Even the irritating odor which does not have the unpleasant taste or unpleasant odor which calcium originally has, and an organic acid has becomes what has a mellow acid taste, and oral recipe can be performed, even when it remains as it is, and even if it adds to all food and drinks. It is the pharmaceutical preparation which can perform supply of calcium, enjoying delicacy until it results [ from an old man ] in a child.

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[Translation done.]